

AMENDMENTS TO THE CLAIMS

Detailed Listing of All Claims 1-42:

1 (Original). A heat exchanger for use in exhaust gas recirculation to cool exhaust gas, the heat exchanger comprising:

5           a substantially rectangular cover plate having a widthwise dimension, a lengthwise dimension that exceeds the widthwise dimension and a plurality of openings that include a liquid inlet opening positioned proximate to a first-~~an~~ end of a lengthwise side of the cover plate and a liquid outlet opening positioned proximate to an opposing end of an opposing lengthwise side of the  
10   cover plate and an exhaust gas inlet opening positioned proximate to a second widthwise side, adjacent to the first side, of the cover plate and an exhaust gas outlet opening positioned proximate to an opposing widthwise side of the cover plate wherein the cross-sectional flow area of the exhaust gas inlet opening exceeds the cross-sectional flow area of the liquid inlet opening, wherein the  
15   cross-sectional flow area of the exhaust gas outlet opening exceeds the cross-sectional flow area of the liquid outlet opening;

          a substantially rectangular upper plate having a widthwise dimension, a lengthwise dimension that exceeds the widthwise dimension and a plurality of openings that include a liquid inlet opening positioned proximate to a first-~~an~~ end of a lengthwise side of the upper plate and a liquid outlet opening  
20   positioned proximate to an opposing end of an opposing lengthwise side of the upper plate and an exhaust gas inlet opening positioned proximate to a second

~~widthwise side, adjacent to the first side,~~ of the upper plate and an exhaust gas outlet opening positioned proximate to an opposing widthwise side of the upper plate, wherein the exhaust gas inlet opening forms a seal with the exhaust gas inlet opening of the cover plate and the exhaust gas outlet opening forms a seal with the exhaust gas outlet opening of the cover plate to prevent exhaust gas flow into a liquid flow space defined by and between the cover plate and the upper plate;

a substantially rectangular lower plate having a widthwise dimension, a lengthwise dimension that exceeds the widthwise dimension and a plurality of openings that include a liquid inlet opening positioned proximate to a ~~first~~ an end of a lengthwise side of the lower plate and a liquid outlet opening positioned proximate to an opposing end of an opposing lengthwise side of the lower plate and an exhaust gas inlet opening positioned proximate to a ~~second~~ widthwise side, adjacent to the first side, of the lower plate and an exhaust gas outlet opening positioned proximate to an opposing widthwise side of the lower plate wherein the liquid inlet opening forms a seal with the liquid inlet opening of the upper plate and the liquid outlet opening forms a seal with the liquid outlet opening of the upper plate to prevent liquid flow into an exhaust gas flow space defined by and between the upper plate and the lower plate; and

a substantially rectangular bottom plate.

2 (Original). The heat exchanger of claim 1, further comprising substantially rectangular openings.

3 (Original). The heat exchanger of claim 1, further comprising one or more  
5 gas flow headers having substantially circular and substantially rectangular cross-sectional areas.

4 (Original). The heat exchanger of claim 1, further comprising one or more liquid flow headers having substantially circular and substantially rectangular  
10 cross-sectional areas.

5 (Original). The heat exchanger of claim 1, further comprising gas flow headers having substantially circular and substantially rectangular cross-sectional areas and liquid flow headers having substantially circular and  
15 substantially rectangular cross-sectional areas.

6 (Original). The heat exchanger of claim 1, wherein the seals comprise brazed seals.

20 7 (Original). The heat exchanger of claim 1, wherein the cover plate, the upper plate, the lower plate and the bottom plate comprise stainless steel.

8 (Original). The heat exchanger of claim 1, further comprising flow partitions positioned in the gas flow space.

9 (Original). The heat exchanger of claim 1, further comprising flow partitions  
5 in the liquid flow space.

10 (Original). The heat exchanger of claim 1, further comprising flow partitions in the liquid flow space and flow partitions in the gas flow space.

10 11 (Original). The heat exchanger of claim 1, further comprising surface indicia on one or more of the plates that act to increase surface area of the one or more plates.

12 (Original). The heat exchanger of claim 1, further comprising surface  
15 indicia on one or more of the plates that act to increase turbulence of liquid flow or gas flow in the liquid flow space or gas flow space, respectively.

13 (Original). The heat exchanger of claim 1, wherein the liquid flow space has a cross-sectional area and a height sufficient to maintain an average Reynolds  
20 number of greater than or equal to approximately 2000 for a liquid flow rate to the liquid flow space of greater than or equal to approximately 160 ml per second.

14 (Original). The heat exchanger of claim 1, further comprising one or more additional upper plates.

5 15 (Original). The heat exchanger of claim 1, further comprising one or more additional lower plates.

16 (Original). The heat exchanger of claim 1, further comprising one or more additional upper plates and one or more additional lower plates.

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17 (Withdrawn). The heat exchanger of claim 1, wherein the substantially rectangular cover plate, the substantially rectangular upper plate, the substantially rectangular lower plate and the substantially rectangular bottom plate have a widthwise dimension that varies with respect to a lengthwise dimension.

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18 (Withdrawn). The heat exchanger of claim 17, wherein, upon operation of the heat exchanger, the lengthwise dimension aligns substantially with the Earth's gravitational force.

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19 (Withdrawn). The heat exchanger of claim 1, further comprising curved substantially rectangular plates.

20 (Canceled).

21 (Original). The heat exchanger of claim 1, wherein the gas inlet connects to  
5 a conduit to receive exhaust gas from an internal combustion engine.

22 (Withdrawn). A heat exchanger comprising:

a substantially circular cover plate having a plurality of openings that  
include a liquid inlet opening positioned substantially opposite a liquid outlet  
10 opening and a gas inlet opening positioned substantially opposite a gas outlet  
opening;

a substantially circular upper plate having a plurality of openings that  
include a liquid inlet opening positioned opposite a liquid outlet opening and a  
gas inlet opening positioned opposite a gas outlet opening, wherein the gas  
15 inlet opening forms a seal with the gas inlet opening of the cover plate and the  
gas outlet opening forms a seal with the gas outlet opening of the cover plate to  
prevent gas flow into a liquid flow space defined by and between the cover plate  
and the upper plate;

a substantially circular lower plate having a plurality of openings that  
20 include a liquid inlet opening positioned opposite a liquid outlet opening and a  
gas inlet opening positioned opposite a gas outlet opening, wherein the liquid  
inlet opening forms a seal with the liquid inlet opening of the upper plate and the

liquid outlet opening forms a seal with the liquid outlet opening of the upper plate to prevent liquid flow into a gas flow space defined by and between the upper plate and the lower plate; and  
a substantially circular bottom plate.

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23 (Withdrawn). The heat exchanger of claim 22, wherein the seals comprise brazed seals.

24 (Withdrawn). The heat exchanger of claim 22, wherein the liquid flow  
10 space serves as a gas flow space and the gas flow space serves as a liquid flow space.

25 (Withdrawn). The heat exchanger of claim 22, wherein the gas inlet connects to a conduit to receive exhaust gas from an internal combustion  
15 engine.

26 (Withdrawn). A heat exchanger core comprising:  
a substantially rectangular cover plate including a fluid inlet opening positioned proximate to a side of the cover plate and a fluid outlet opening  
20 positioned proximate to an opposing side of the cover plate;  
a substantially rectangular upper plate including a fluid inlet opening positioned proximate to a side of the upper plate and a fluid outlet opening

positioned proximate to an opposing side of the upper plate, wherein the fluid inlet opening substantially coincides with the fluid inlet opening of the cover plate and wherein the cover plate and the upper plate define a fluid flow space between the cover plate and the upper plate;

5           a substantially rectangular lower plate including a fluid inlet opening positioned to a side of the lower plate and a fluid outlet opening positioned proximate to an opposing side of the lower plate, wherein the fluid inlet opening forms a seal with the fluid inlet opening of the upper plate and the fluid outlet opening forms a seal with the fluid outlet opening of the upper plate to prevent  
10 fluid flow into an exterior flow space defined at least partially by and positioned at least partially between the upper plate and the lower plate; and  
          a substantially rectangular bottom plate.

27 (Withdrawn).     The heat exchanger core of claim 26 wherein the fluid inlet  
15 openings form a fluid flow shaft.

28 (Withdrawn).     The heat exchanger core of claim 27, wherein the fluid flow shaft comprises a fluid flow shaft having a major axis substantially normal to the cover plate, the upper plate, the lower plate and the bottom plate.

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29 (Withdrawn).     The heat exchanger core of claim 26, wherein the seals comprise brazed seals.



30 (Withdrawn). The heat exchanger core of claim 26, wherein the cover plate, the upper plate, the lower plate and the bottom plate comprise stainless steel.

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31 (Withdrawn). The heat exchanger core of claim 26, wherein the cover plate, the upper plate, the lower plate and the bottom plate comprise one or more convex sides.

10 32 (Withdrawn). The heat exchanger core of claim 26, wherein the cover plate, the upper plate, the lower plate and the bottom plate comprise arcuate and convex widthwise sides.

33 (Withdrawn). The heat exchange core of claim 27, wherein the shaft  
15 resides at least partially within an area defined by a convex side.

34 (Withdrawn). The heat exchange core of claim 26, further comprising a basket wherein the core is positioned at least partially within the basket.

20 35 (Withdrawn). The heat exchange core of claim 34, wherein the cover plate forms a seal with an edge of the basket.

36 (Withdrawn). The heat exchange core of claim 34, wherein the basket has a plurality of openings.

37 (Withdrawn). The heat exchange core of claim 36, wherein the plurality  
5 of openings include an inlet opening and an outlet opening for access to the exterior fluid space.

38 (Withdrawn). The heat exchange core of claim 34, wherein the core has convex widthwise sides and the basket includes concave basket ends that  
10 complement the convex widthwise sides.

39 (Withdrawn). The heat exchange core of claim 38, wherein the basket ends reduce eddy formation proximate to an inlet opening of the basket.

15 40 (Withdrawn). A heat exchanger comprising:  
a heat exchanger core having a core side fluid space and a cover plate;  
and  
a substantially U-shaped wall fitted at one end with an inlet header and,  
at an opposing end, with an outlet header, which, in combination with the cover  
20 plate, define a shell side fluid space.

41 (Withdrawn). The heat exchanger of claim 40, wherein the cover plate forms two seals with two opposing sides of the substantially U-shaped wall, forms a seal with the inlet header and forms a seal with the outlet header.

- 5 42 (Withdrawn). The heat exchanger of claim 41, wherein the cover plate defines a core side fluid space with an upper plate of the heat exchanger core.

REMARKS

Applicant graciously appreciates the Office's attention to the instant application. In view of the following remarks, Applicant respectfully requests reconsideration and allowance of the subject application. This amendment is  
5 believed to be fully responsive to all issues raised in the November 29, 2005 Office Action.

Abstract

In the Office Action of November 29, 2005, the Office objected to the  
10 Abstract. Upon allowance of one or more claims, Applicant will amend the Abstract as requested by the Office, per MPEP §608.01(b).

Claim 18

In the Office Action of November 29, 2005, the Office stated reasons as  
15 to why claim 18 is not part of the elected subject matter. To expedite prosecution, claim 18 is currently withdrawn. Applicant reserves the right to present claims to non-elected subject matter, as well as other subject matter of the instant application, in one or more continuing applications.

20 Claim 1

To expedite prosecution and to more particularly and distinctly claim subject matter of the elected species, Applicant currently amends claim 1. In